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ABSTRACT

The report presents the results of a project in the research program area of teacher education conducted by the Minnesota Research Coordinating Unit for Vocational Education. The specific objectives of this project were to: (1) provide an estimate for future need for teachers in vocationally reimbursed teaching positions in Minnesota, and (2) identify and describe the relative size of sources of teachers in these positions. Conduct of the study was accomplished in two phases. The first phase employed the Delphi technique with a group of experts and the second phase involved sampling schools having vocational education programs with vocationally reimbursed positions. The findings show: (1) a need for approximately 370 new teachers each year over the next five years, (2) the estimated average annual total number of full-time teachers in vocationally reimbursed positions over the next five years will be approximately 4,750, (3) a number of reimbursed teachers in new program levels will be added in the next five years, and (4) each program area has a large number of part-time teachers for adult programs. Summary data on future demand and average annual growth or decline of teachers, and summary data on factors affecting the supply of teachers is appended. (Author/KB)

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Minnesota Research Coordinating Unit
for Vocational Education
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The Need for and Sources of TEACHERS IN VOCATIONALLY REIMBURSED POSITIONS in Minnesota

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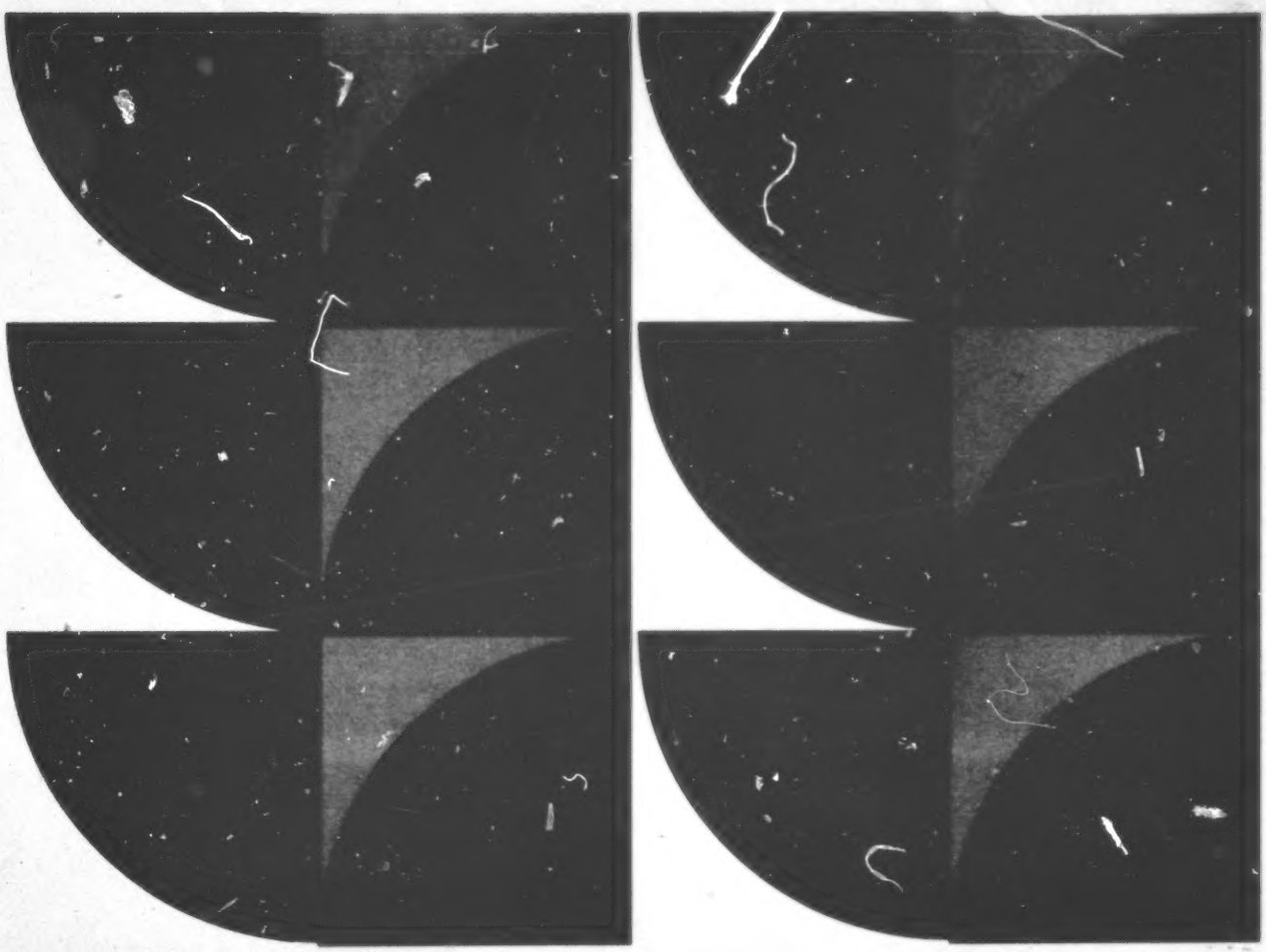

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THE MINNESOTA RESEARCH COORDINATING UNIT FOR VOCATIONAL EDUCATION performs the following four functions in behalf of the State and national systems of vocational education:

1. Stimulate, facilitate and coordinate innovative research and development efforts.

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3. Increase the number and improve the competence of producers and consumers of vocational research-related materials.

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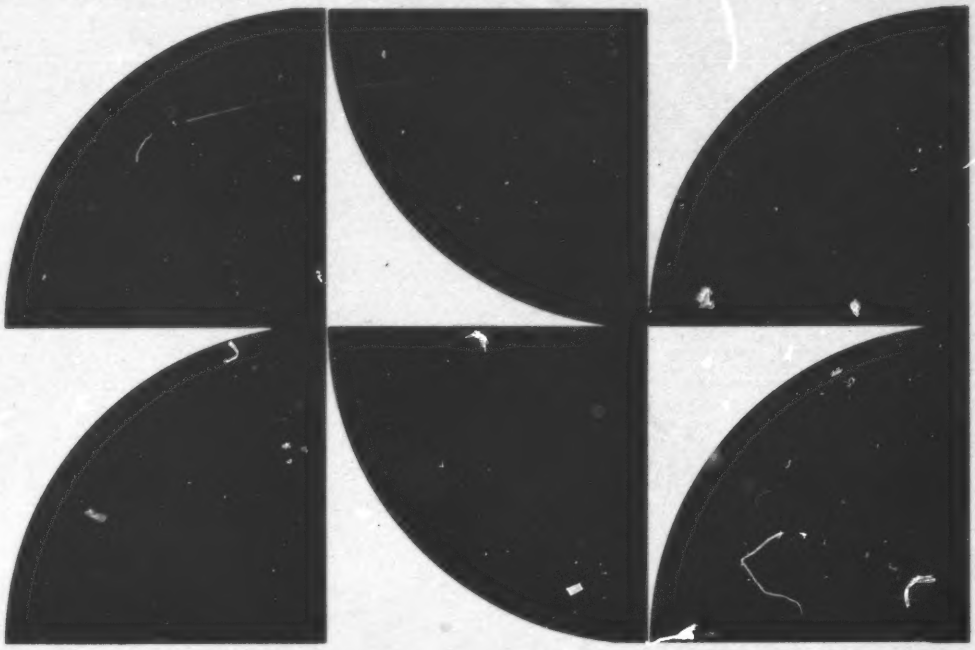
The Need for and Sources of TEACHERS IN VOCATIONALLY REIMBURSED POSITIONS in Minnesota

by George Copa and Robert W. Korpi



Minnesota Research Coordinating Unit
for Vocational Education
University of Minnesota
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PREFACE

This report presents the results of one project in the research program area of teacher education conducted by the Minnesota Research Coordinating Unit for Vocational Education. The specific objectives of this project were to: (1) Provide an estimate of future need for teachers in vocationally reimbursed teaching positions in Minnesota and (2) identify and describe the relative size of sources of teachers in these positions. Vocationally reimbursed positions are those reimbursed under the Minnesota State Plan for Vocational Education. This information was considered to be of high priority in educatinal planning and policy making directed at providing an effective and efficient vocational education system for the future in Minnesota.

Some of the original data collection and analysis for this study was done by Charles Keifer now with the Michigan State Department of Education. The present authors collected additional information, applied a different analysis scheme, and wrote the final report.

Special acknowledgements are due the twenty-two members of the Division of Vocational-Technical Education, Minnesota State Department of Education, and the five vocational teacher educators from Minnesota's colleges and University who composed a panel of experts supplying their judgement during data collection. Also, acknowledgement is due the many educational administrators who replied to our request for information concerning the vocational teachers in their schools. Our thanks to Jerome Moss, Jr., Division of Vocational-Technical Education, University of Minnesota who was involved in the project from its start, providing a sounding board for ideas, helpful advice and a critical editorial eye. Thanks also to Edgar Persons, Department of Agricultural Education, University of Minnesota, and Melvin Johnson, Division of Vocational-Technical Education, Minnesota State Department of Education for their insightful observations and comments on a first draft of this report.

CHAPTER I

BACKGROUND, PURPOSE AND MODELS

Minnesota's publicly-supported system of vocational education includes classes offered in thirty-three area vocational-technical institutes, twenty junior colleges, about fifty secondary vocational centers, and most of the four hundred forty-six independent secondary school districts. A critical input required for the maintenance and growth of this system is qualified teachers. Without enough qualified teachers the system will begin to falter. Given the size of the system and importance of teachers as an input, detailed educational planning and careful educational policy making with regard to the supply and demand of instructional personnel will be required in order to provide effective and efficient vocational education programs in the future.

The research problem in this study is to provide an estimate of future need for teachers in vocationally reimbursed positions and identify and describe the relative size of sources of supply of these teachers. This information is of high priority in the educational planning and policy making processes cited above.

GROUP OF CONCERN

An explicit definition of the persons covered under the label of teachers in vocationally reimbursed positions will identify the group being examined in this study and, also of importance, the group being omitted. Teachers in vocationally reimbursed positions are defined as those whose salaries are being reimbursed under the provisions of the Minnesota State Plan for Vocational Education.[1] This definition excludes those persons who may be teaching vocational subjects (i.e., business and office, home economics, industrial arts) but who are not vocationally reimbursed. Looking into the future, it excludes persons teaching vocational subjects full-time below the tenth grade--according to present policy, they will not receive vocational reimbursement from the State Department of Education.

Figure 1 presents the structure that will be used to display information in this report. The structure has the dimensions of program area and program level. The program areas employing vocationally reimbursed teachers included in this study and the occupational clusters they include[2] are as follows:

Program Area	Occupational Clusters Included
Agriculture	Agriculture, Natural Resources, Environment, and Marine Science

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[1] "A State Plan for the Administration of Vocational Education Under the Vocational Education Amendments of 1968 and Part F, Higher Education Act of 1965, State Department of Education, St. Paul, Minnesota, 1972.

[2] "Minnesota Educational Directory 1972-73", Minnesota State Department of Education, St. Paul, Minnesota. 1972.

Program Area	Occupational Clusters Included
Business & Office	Business & Office, Fine Arts, and Humanities
Distributive	Distributing and Marketing
Health	Health and Public Service
Home Economics	Consumer Homemaking, Personal Service, Recreation, and Hospitality
Technical	Technical
Trade and Industrial	Transportation, Manufacturing, Construction, Communications, and Media

Use of this structure excludes teachers who are providing pre-vocational programs in which the instructional content is of a general occupational nature designed to orient the student to and explore the world of work. Many "career education" teachers are therefore excluded from this study.

The other dimension of the structure presented in Figure 1 is program level. The program levels covered in this study and their corresponding definitions are as follows:

Program Level	Description
Elementary	Programs offered in grades kindergarden through six in public schools.
Secondary	Programs offered in grades seven through twelve in public schools.
Post-Secondary	Programs offered in public post-secondary area vocational-technical insitutes and junior colleges for the purpose of preparatory occupational training.
Adult	Programs offered in public secondary and post-secondary area vocational-technical institutes for the purpose of supplementary occupational training. These programs are subdivided into those using full-time and part-time teachers.
Special	Programs offered for special populations in the above mentioned public institutions.

By definition, the group of concern excludes teachers who provide instruction in vocational subjects at private secondary and post-secondary vocational schools

and special institutions (i.e. schools for handicapped and disabled, schools at correctional facilities for incarcerated persons). It also excludes those teaching Manpower Training and Development Administration programs, apprenticeship programs, and industry sponsored training programs.

Using Figure 1 as a guide, the group of concern in this study is therefore vocationally certified teachers whose salaries are reimbursed under the Minnesota State Plan for Vocational Education in the program areas of agriculture, business and office, distributive, health, home economics, technical, and trade and industrial at the program levels of public elementary, secondary, post-secondary vocational institutes and junior colleges, and adult programs at the aforementioned levels. As already pointed out, there are several groups of teachers of vocational subjects that are excluded by this definition. The exclusions are intentional since the purpose of the study is to concentrate on those teachers of vocational programs which are being at least partially financed under the Minnesota State Plan for Vocational Education.

	Program Level					
Program Area	Elementary	Secondary	Post Secondary	Adult Part-Time	Adult Full-Time	Special
Agriculture						
Business & Office						
Distributive						
Health						
Home Economics						
Technical						
Trade & Industrial						

Figure 1

Structure for Defining How Teachers in Vocationally Reimbursed Positions Are Classified in This Study

Another fact of importance for interpretational purposes is that the group of concern includes only a subgroup of teachers. The personnel to operate the vocational education system in Minnesota also includes administrators, specialists, and para-professionals in the schools as well as those in the State Department of Education and teacher education and vocational research institutions. The group of concern in this study is therefore only a part, however critical, of

total personnel needed to operate an effective and efficient state program of vocational education.

PURPOSE OF STUDY

The preparation of teachers for vocationally reimbursed positions requires substantial financial resources as well as a relatively long period of time (four years of college plus occupational experience in many cases). In this context, it is useful to have estimates of future need for vocational teachers. For example, teacher education institutions require information about need at least five years in advance of when the need will exist if they are to recruit the necessary freshmen and provide adequate facilities and instructional staff to prepare an adequate supply of teachers. Prospective teachers, as students, must be provided information about demand if they are to have an accurate picture of the labor market they will face upon graduation.

In addition to knowing about future need for teachers in vocationally reimbursed positions, those responsible for planning and controlling the process of teacher education must be aware of the alternative sources of supply. Who are the competitors in producing a supply of instructors capable of taking a vocationally reimbursed position? What share of the market is controlled by each supplier?

In view of these problems, this study was conducted to answer the following questions:

1. What is the expected future need for teachers in vocationally reimbursed positions for each vocational program area and level in Minnesota?

2. What are the sources and relative size of various sources of supply of teachers in vocationally reimbursed positions for each vocational program area and level in Minnesota?

Because four year institutions are an important source of supply, information about demand (particularly as it relates to growth or decline in number of teachers) is required for a period of at least five years in the future.

MODEL OF SUPPLY AND DEMAND PROCESS

In order to communicate the context within which the supply and demand of teachers in vocationally reimbursed positions is determined, models were constructed as shown in Figure 2. In the models, demand is defined as the total number of positions to be filled by vocational teachers in a particular year. Supply is defined as the total number of persons available to fill the positions as they exist; supply includes those already employed as teachers who wish to remain teachers as well as those persons seeking teaching positions for the first time.

As seen in Figure 2, the factors which tend to decrease supply from one time period to another are termed out flow factors. The definitions of these factors are as follows:

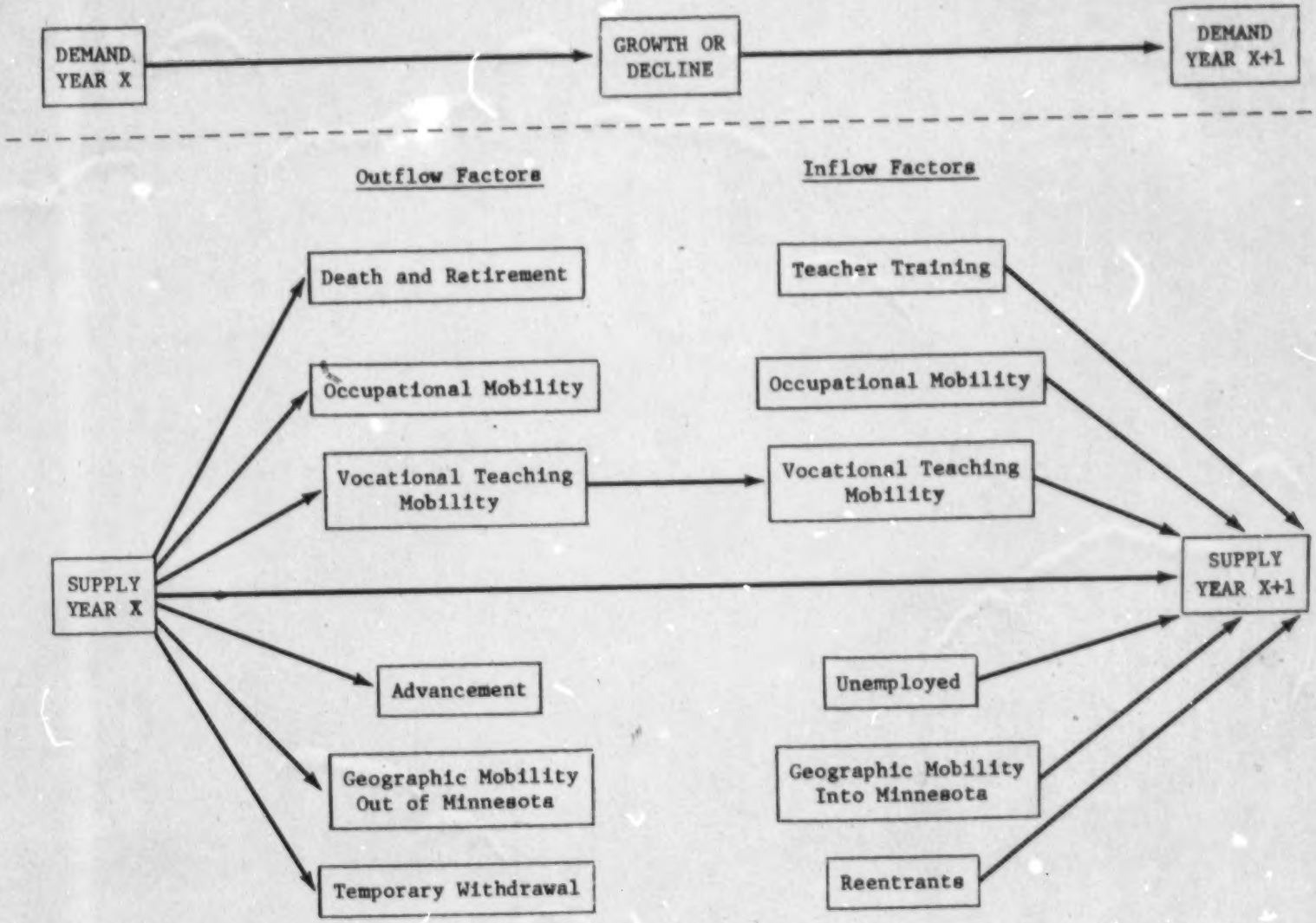

Figure 2

Model of Demand and Model of Supply for Vocational Education Teachers

1. Geographic Mobility Out of Minnesota - contains all those who leave vocational teaching in Minnesota and simultaneously leave Minnesota.

2. Geographic Mobility Within Minnesota - is composed of all those persons who leave a vocational teaching position in Minnesota but remain in Minnesota. The group includes the following:
   a) Deaths and Retirement - is made up of all those teachers who cease teaching due to death or retirement.
   b) Advancement - is composed of all teachers who cease teaching to assume positions as counselors, supervisors, or administrators in vocational education in Minnesota.
   c) Vocational Teaching Mobility - is made up of teachers who leave one vocational teaching position in Minnesota for another vocational teaching position in Minnesota.
   d) Occupational Mobility - is the group of people who leave vocational teaching for another occupation or unemployment. The other occupation may be in other areas of education or industry but must be located in Minnesota.
   e) Temporary Withdrawal - is composed of those persons who leave vocational teaching for a temporary period. They may leave because of accident, sickness, or other reasons but plan to return later to vocational teaching in Minnesota.

As supply is being decreased by the out flow factors there is another group of factors working to increase supply from one time period to another. These latter factors, termed in flow factors in Figure 2 are defined as follows:

1. Geographic Mobility Into Minnesota - is composed of those persons entering vocational teaching positions in Minnesota directly from outside Minnesota. These persons are already trained and experienced enough to meet the vocational certification requirements upon entering Minnesota.

2. Geographic Mobility Within Minnesota - is made up of all those persons entering vocational teaching in Minnesota directly from inside Minnesota. This group includes the following:
   a) Teacher Training - contains people who enter teaching immediately after being prepared by a Minnesota teacher training institution (degreed and non-degreed persons).
   b) Unemployed - is composed of persons who were not employed immediately prior to entering vocational teaching although they were actively seeking work.
   c) Vocational Teaching Mobility - contains people who enter a vocational teaching position directly from another vocational teaching position.
   d) Occupational Mobility - is made up of persons who enter vocational teaching positions from another occupation (including non-vocational teaching) by obtaining the required training and experience.
   e) Re-entrants - is composed of people who have previous vocational teaching experience who reenter vocational teaching after an absence.

The supply of vocational teachers from one time period to another is determined by subtracting the effects of the out flow factor between the time periods

from the supply which existed in the first time period and adding the effects of the in flow factors between the time periods. For example, if the time periods were 1973 and 1974, there were 2000 vocational teachers available to fill positions in 1973 (supply in 1973), the out flow between 1973 and 1974 was 400 teachers, and the in flow between 1973 and 1974 was 500 teachers, then supply in 1974 would be 2100 teachers (2000 - 400 + 500 = 2100).

In referring to Figure 2, it is evident that those teachers experiencing "vocational teaching mobility" are counted as part of both the out flow and in flow factors; these teachers represent internal occupational mobility in vocational teaching. They are included in the supply-demand model because they: (1) added to the actual list of vacancies between time periods considered, (2) add to an accurate description of labor market activity, and (3) allow identification of the entry level positions in a given program area of vocational education (for example, within program area there is reason to hypothesize that teachers will tend to move from secondary positions to adult and post-secondary positions leaving secondary positions as the entry-level positions for that area --documentation of vocational teaching mobility insures identification of this effect).

In the model depicted in Figure 2, demand for vocational teachers at a given time period is determined by identifying demand for a previous time period and adding any growth or decline in number of positions which occurs between the time periods. Note that demand is a count of positions while supply is a count of people.

The need for new teachers can be derived from the model by adding together the growth or decline in demand and the teachers lost from supply through the out flow factors (excluding vocational teaching mobility) for any given time interval. This means of deriving demand assumes that all teachers who leave a position will be replaced.

The supply - demand model which was formulated has the characteristics of:

1. Describing both supply of and demand for vocational teachers for past as well as future time periods with the length of time periods being flexible.

2. Describing supply and demand in terms of both total number of teachers and total number of positions, respectively, as well as marginal number (new) teachers added and marginal number (new) positions added between time periods.

3. Identifies the factors which affect supply and demand and their relative size for use in defining alternative strategies for altering either or both supply and demand.

PROCEDURE

Conduct of the study was accomplished in two phases. The first phase entailed obtaining estimates of growth or decline in number of vocationally reim-

bursed positions in order to estimate change in demand. This was accomplished using the Delphi Technique[3] with a group of experts having knowledge upon which to base future estimates.

The second phase was designed to describe the effects of the factors influencing supply. Information for this phase was obtained by sampling schools having vocational education programs with vocationally reimbursed positions at various vocational levels and areas (see Figure 1).

The time period selected for study was the school years 1972-73 to 1978-79. The summary data are presented in terms of yearly averages during this time period.

SUMMARY

Since vocational teachers are a critical input into the process of vocational education in Minnesota and preparation of teachers requires substantial costs to the State and to the prospective teacher during preparation, advance education planning and effective educational policy concerning the supply and demand of teachers are significant activities to the administrators of vocational education in Minnesota. The purpose of this study is to provide information about future supply and demand for teachers in vocationally reimbursed positions which will be useful in the planning and policy making processes.

Supply and demand is described in terms of vocational program areas and levels. Both the in flow and out flow factors affecting supply and the growth and decline affecting demand are estimated. Information about supply and demand is presented as a yearly average for the time period 1972-73 to 1978-79.

The second chapter of this report contains a description of Phase I of the study; Phase II is described in the third chapter. The information resulting from the two phases is integrated along with a set of conclusions in the fourth chapter of the report. Detailed information is presented in the Appendices.

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[3] Milkovich, George T., Antony J. Annon, and Thomas A. Mahoney. "The Use of the Delphi Procedures in Manpower Forecasting", Management Science, Vol. 19, No. 4, Part I, December, 1972.

CHAPTER II

PHASE I: ESTIMATING DEMAND

As previously defined, demand for teachers in vocationally reimbursed positions is the total number of positions to be filled at a particular point in time. Demand at a future time period is determined by estimating the growth or decline in number of positions between the present and the future time period and adding it to present demand. In this context, demand includes positions which are or will be filled by those already teaching as well as new entrants to vocational teaching.

PURPOSE

The purpose of this phase of the study was to provide an estimate of demand for teachers in vocationally reimbursed positions in each program area and level identified in Chapter I (see Figure 1). Demand was estimated for the school years 1972-73, 1974-75, 1978-79, and 1983-84. These time periods were chosen since the study would be completed during the 73-74 school year which would then represent the "present". The years 1974-75, 1978-79, and 1983-84 then represent one, five, and ten years into the future, respectively. The five and ten year estimates are essential for the planning needs of teacher education institutions as explained earlier.

PROCEDURE

The Delphi technique[4] was used to obtain demand estimates for the selected future time periods. This technique was particularly appropriate to the problem of estimating demand in this situation because it would have been difficult to get the group of selected experts together in one meeting and, more important, because independent estimates were desired from each expert. This latter concern allowed the expert to use information which was unique to his or her position in making future estimates of demand. It also forced each expert to make an estimate in the program area(s) and level(s) where he/she felt confident.

Sample of Experts

The sample of experts for this phase of the study consisted of twenty-seven persons representing the State Department of Education and teacher education institutions. The group was also chosen to represent all the vocational program areas and levels defined in Figure 1. All experts held positions in Minnesota. Each program area had a representative of both the State Department and teacher education with the exception of health where there were no teacher education programs. Except for the program area of health, each area was represented by one teacher educator and one to five State Department representatives. The teacher

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[4] Ibid.

educator was selected from the teacher education institution having the largest graduating class of teachers at the bachelors level for the selected program area.[5] Three different teacher education institutions were represented by the selected experts. The State Department representatives were selected from those persons who were coordinators or supervisors in the Program Operations Section of the Division of Vocational and Technical Education.[6]

This group of experts was chosen because they represented both those who manage and control the vocational education system in Minnesota at the state level and those who prepare teachers. Each group had an interest in the estimation of demand for teachers in vocationally reimbursed positions and had information and experience on which to make the best estimates obtainable. Each of these groups could also make estimates with a state perspective rather than being influenced by the situation in a particular locale.

Data Collection Instruments and Procedure

Data collection for Phase I was accomplished with two mailings to the panel of experts. The experts were asked to make estimates for only the program level and area which was appropriate for them based on their position and previous experience.

The first mailing was made to solicit an initial estimate of future demand for the selected years. Estimates for the 1984-85 time period were to indicate only expected trend rather than being point estimates. In this mailing, the experts were given information on the number of vocationally reimbursed teachers in the selected program area and level for each school year from 1967-68 to 1971-72, the number of students enrolled in the selected program area and level for each school year from 1967-68 to 1971-72,[7] and a projection of secondary school graduates, post-secondary area vocational institute enrollment, junior college system enrollment, and private and professional school system enrollment for Minnesota for the time period 1973-1989.[8] The experts were asked to review the information and other information they had available (such as new program developments and expected financial picture) and make a best estimate of the number of reimbursed teaching positions which would need to be filled for each of the selected future time periods. The estimate was not to represent what should be but rather what could reasonably be expected given all the forces that come into

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[5]"Minnesota State Plan for Vocational Education for July 1, 1971 to June 30, 1972," Minnesota State Department of Education.

[6]"Minnesota Educational Directory - 1972-73", State of Minnesota Department of Education, St. Paul.

[7]Records of Division of Vocational and Technical Education, Minnesota State Department of Education, St. Paul.

[8]"Projecting Institutional Enrollments, 1973-1989", Minnesota Higher Education Coordinating Commission, St. Paul, 1973.

play. The experts were encouraged to add supplementary comments to their estimates especially noting information or factors which were of use to them in making their estimates. The forms containing their estimates and comments were then to be returned to the study staff.

In the second mailing the experts were given a summary of estimates for their particular program area and level and the form with their original estimates. They were asked to review the summary data and supplementary comments made by the other experts and make any changes in their original estimates which they felt were needed. The experts were to return the summary data forms indicating no change was made or in the cases where changes were made, what the changes were.

Summary data forms were then recompiled. These data represented the information used to provide the desired estimation of demand for teachers in vocationally reimbursed positions in Minnesota.

RESULTS

Twenty-two of the twenty-seven selected experts (81 percent) responded with demand estimates. The summary data are presented in Appendix I for program levels within each program area.

Using the information presented in Appendix I, the answer to the question concerning total demand is shown in Table 1. The table presents the demand for teachers in vocationally reimbursed positions for the selected program areas and levels for the time periods 1972-73, 74-75, 78-79, and 84-85. For example, the demand for secondary vocational agriculture teachers is expected to be 331, 329, 343, and 357 for each of the respective time periods. Note that only the vocationally reimbursed teachers are counted; for areas such as agriculture and distributive this number includes almost all vocational agriculture and distributive teachers in Minnesota's public secondary and post-secondary schools since they are almost all vocationally reimbursed but a much lower proportion of other program areas such as secondary level business and office teachers (about one-fourth are vocationally reimbursed at secondary level, these are mainly model office teachers and cooperative office education teacher coordinators), trade and industrial teachers (about one-sixth are vocationally reimbursed at the secondary level if industrial arts teachers are counted in the total, these are mainly teaching in secondary vocational centers or in metropolitan areas), and home economics teachers (about one-half are vocationally reimbursed at the secondary level). Most vocational education teachers at post-secondary and adult levels in all program areas are vocationally reimbursed.

The data presented for the time period 1984-85 should be used only to interpret long range trends. Reliability of estimates can be obtained by referring to the statistics presented on range in estimate in Appendix I. For example, in Agriculture from Table 8 in Appendix I, for the full-time adult program teachers in the school year 1974-75 there were three experts making demand estimates; the estimates ranged from 89 to 140 teachers. As shown in Appendix I, there is often a wide range in the estimates indicating that reliability may be low. With low reliability in the estimates, caution must be used in interpreting the mean of the

Table 1

ESTIMATED TOTAL DEMAND FOR TEACHERS IN VOCATIONALLY REIMBURSED POSITIONS IN MINNESOTA

Program Areas	PROGRAM LEVELS					
	Elementary	Secondary	Post-Secondary	Adult Part-time	Adult Full-time	Special
Agriculture						
1972-73	1	331	44	245	97	48
1974-75	9	329	48	238	106	88
1978-79	21	343	57	217	130	55
1983-84	41	357	62	197	162	0
Business and Office						
1972-73	-	503	290	515	-	-
1974-75	-	517	298	528	-	-
1978-79	-	515	305	563	-	-
1983-84	-	508	300	600	-	-
Distributive						
1972-73	-	155	123	143	5	-
1974-75	-	203	150	160	8	-
1978-79	-	247	180	188	11	-
1983-84	-	298	240	218	14	-
Health						
1972-73	-	57	189	75	-	-
1974-75	-	125	220	100	-	-
1978-79	-	275	250	125	-	-
1983-84	-	350	250	150	-	-
Home Economics						
1972-73	4	1317	40	245	10	10
1974-75	4	1122[a]	45	225	15	12
1978-79	21	1271	50	252	18	15
1983-84	72	1369	55	300	25	15
Technical						
1972-73	-	-	237	233	5	-
1974-75	-	-	253	273	7	-
1978-79	-	-	277	315	12	-
1983-84	-	-	303	371	15	-
Trade and Industry						
1972-73	-	225	596	800	35	-
1974-75	-	317	573	832	35	-
1978-79	-	450	645	845	47	-
1983-84	-	458	681	950	55	-

[a]The experts making this estimate of demand explained that the decline in number of positions for secondary home economics between 1972-73 and 1974-75 was not caused by a decline in programs but rather by the fact that home economic teacher teaching below the tenth grade would no longer receive reimbursement and therefore were removed from population of vocational teachers as defined in this study - although, the positions still exist and may even be expanding in secondary schools.

Table 2

ECTIMATED ANNUAL GROWTH OR DECLINE IN DEMAND FOR TEACHERS IN VOCATIONALLY REIMBURSED POSITIONS IN MINNESOTA (1972-73 TO 1978-79)

PROGRAM AREAS	PROGRAM LEVELS						TOTAL[a]
	Elementary	Secondary	Post-Secondary	Adult Part-time	Adult Full-time	Special	
Agriculture	3	2	2	-5	6	1	14
Business and Office	-	2	3	8	-	-	5
Distributive	-	15	10	8	1	-	26
Health	-	36	10	8	-	-	46
Home Economics	3	-8[b]	2	1	1	1	-1
Technical	-	-	7	14	1	-	8
Trade and Industrial	-	38	8	8	2	-	48
TOTAL	6	85	42	42	11	2	146

[a]Does not include part-time adult instructors since in most cases they are already counted under secondary or post-secondary or teach only part-time.

[b]See note "a" in Table 1 for explanation.

estimates, particularly when the number of experts making estimates is small (i.e. one or two). The rationale for using the mean as a "best" estimate, given the shortcomings of the data in terms of reliability, is that: (1) A "best" point estimate was desired, (2) when the number of experts making estimates is small (i.e. one or two), they are in most cases not a sample but rather the full population of those best qualified to provide an estimate and therefore their estimates represent the best information available and (3) when the number of experts is larger (i.e. three or more), it is assumed that some experts will error high and others low with the mean of their estimates representing the best information available.

Table 2 provides an estimate of average annual growth or decline for the period from 1972-73 to 1978-79. The average annual growth or decline was calculated by subtracting the estimated number of positions in 1972-73 from the number in 1978-79 and dividing the difference by six. For example, in the case of full-time adult vocational agriculture teaching positions, ninety-seven (positions in 1972-73) subtracted from one hundred thirty (positions in 1978-79) equals thirty-three; the difference, thirty-three, divided by six gives an average annual growth of six positions. The assumption was made that growth or decline will occur by an equal amount each year during the six year period.

SUMMARY

The purpose of this phase of the study was to provide an estimate of demand for teachers in vocationally reimbursed positions for each of several pre-selected program areas and levels. The estimates presented represent estimates made by a group of selected experts based on an assessment of available information about the future and a best guess about some unknown factors. As this information changes and these factors become known, it is reasonable to expect that the estimates would change. However, the point of view taken is that no planning could be done at all if one had to wait for perfect information.

CHAPTER III

PHASE II: ESTIMATING FACTORS AFFECTING SUPPLY

As previously defined, supply is the total number of persons available to fill job positions as they exist. The factors which affect the supply of vocationally certified teachers were identified and described in Chapter I (see Figure 1). Knowledge of the size of the factors subtracting from supply (out flow factors) and adding to supply (in flow factors) should have implications for local vocational directors who have the job of recruiting teachers, for teacher education institutions who have the responsibility of preparing an adequate number of qualified teachers and for state department supervisors and coordinators who have the task of administering the state wide effort of providing vocational education.

The out flow factors (i.e. geographic mobility, death, and retirement) generate a need for new teachers in vocationally reimbursed positions. Adding the size of out flow to the estimate of demand (caused by growth or decline in total number of teaching positions) determined in the previous chapter will provide an estimate of total number of new teachers needed to fill vocationally reimbursed positions at a particular time. The in flow factors represent the sources of teachers. The relative size of these factors provides an estimate of the importance of each source in filling the need for new teachers.

PURPOSE

The purpose of this phase of the study was two fold. It was to provide an estimate of: (1) The size of out flow factors which decrease the supply of teachers in vocationally reimbursed positions and (2) the relative historic importance of various sources (in flow factors) of teachers in vocationally reimbursed positions. These estimates were derived for each program area and level of vocational education in Minnesota.

PROCEDURE

To achieve the above purposes, historical data was compiled about teachers in a sample of vocational education programs for a five year period of time, 1966-67 through 1971-72. This information was then used to make estimates about the future assuming the historical trends would continue unchanged.

Sample of Programs

A selective sample of schools having vocational programs in various vocational areas and levels was first identified. The sample was selected so that all vocational program areas (i.e. agriculture, business and office) and levels (i.e. secondary, post-secondary) were represented by several schools and that no school was included under more than one of the program levels. The concern was

to limit the amount of information which had to be supplied by any one school to only one program level.

Data Collection Instruments and Procedure

A data collection instrument and cover letter was mailed to the superintendent or vocational directors in the selected sample of schools. The data collection instrument was divided into two major sections which related to in flowing teachers (teachers who had been hired) and out flowing teachers (teachers who had left). The school administrators were first asked to indicate the number of teachers in vocationally reimbursed positions who had come from various sources (i.e., teacher education institutions, other jobs) over the past five years. Second, the school administrators were asked to indicate what had happened to teachers who had left a vocationally reimbursed teaching position in their school during the past five years. During the study, data covering the full population of agriculture education teachers with regard to movement in and out of teaching over a five year period became available and was used as a substitute for information collected in this study.[9]

RESULTS

Results of data collection are shown separately for in flow and out flow factors affecting the supply of teachers in vocationally reimbursed positions. A total of 183 questionnaires were sent to school administrators of which 156 (85 percent) were returned. Out of the 156 questionnaires returned, 21 were discarded because the administration stated they did not have reimbursed teachers in particular vocational program areas or levels. Therefore, 135 questionnaires were analyzed.

Out Flow Factors

The size of each out flow factor based on the data collected is shown in Appendix II. A summary of this information is shown in Table 3. The size of out flow is presented as a rate in Table 3. The rate is a percent of the total number of vocationally reimbursed teachers employed in the program area and level. For example the twelve percent estimated rate indicated for secondary agriculture teachers means that on the average over the past five years twelve out of every one hundred secondary vocational agriculture teachers in vocationally reimbursed positions had to be replaced each year. These teachers may have moved out of Minnesota or stayed in Minnesota, advanced to a new position in education, died or retired, moved to a different occupation outside of education or temporarily withdrew from teaching. In the case of agriculture teachers, almost one-third of those leaving went into farming.[10] It is assumed that each of the vacancies created by the out flow factors represents a position to be filled by replacement.

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[9]Thomas, Ruth, Dennis Moeller, Julie Robinson, and Edgar Persons. "Job Mobility Patterns for Teachers of Vocational Agriculture in Minnesota", unpublished paper, Division of Agriculture Education, University of Minnesota, 1974. This study covered the full population of teachers from 1969-70 to 1973-74 school years.

[10]Ibid.

Table 3

RATE OF REPLACEMENT OF EMPLOYED TEACHERS IN VOCATIONALLY REIMBURSED POSITIONS IN MINNESOTA (1966-67 TO 1971-72)[a]

PROGRAM AREA	PROGRAM LEVEL			
	Secondary	Post-Secondary	Adult	Special
Agriculture[b]	12%	13%	6%	10%
Business and Office	4	4	-	-
Distributive	4	5	-	-
Health	2	4	-	-
Home Economics	5	3[c]	-	-
Technical	-	4	-	-
Trade and Industrial	4	3	-	-

[a]Expressed as annual percent of total number of teachers employed in the program area and level. A reasonable range in the estimates (given the average ratio of sample size to population size, given a chance of capturing the true value within the range in 90 out of 100 samples, and assuming a random sample) is the estimate given in the table plus or minus 3.

[b]The data base used to derive the rates for vocational agriculture teachers was taken from the study "Job Mobility Patterns for Teachers of Vocational Agriculture in Minnesota" by Ruth Thomas, Dennis Moeller, Julie Robinson, and Edgar Persons, Division of Agriculture Education, University of Minnesota, 1974.

[c]The rate estimated for post-secondary home economics teachers was assumed to be the same as for post-secondary trade and industrial teachers since in the post-secondary vocational-technical institutes the programs are often grouped with the trade and industrial programs.

Those moving to another vocationally reimbursed position represent a special case and are not included in Table 3. These teachers cause labor market activity but do not really create the need for a new teacher in the state since they leave one position but fill another.

In Flow Factors

The actual data collected on in flow factors (sources of teachers in vocationally reimbursed positions) is presented in Appendix II. The summary information on the relative size of flow from various sources is shown in Table 4. The sources specifically identified in Table 4 are new graduates from teacher education institutions in Minnesota and all other sources. All "other sources" includes those entering by geographic mobility into Minnesota from other states, occupational mobility from industry or a non-vocational teaching position, re-entrants to vocational teaching, and those unemployed previous to teaching. The percent of flow from each of these sources over the past five years is indicated for each program area and level. For example, of the secondary vocational agriculture teachers who were hired into vocationally reimbursed positions in Minnesota over the past five years, 44% were new graduates from teacher education institutions in Minnesota and 56% came from other sources.

Teachers moving from another vocationally reimbursed position were excluded as a source in Table 4 because it had already been subtracted out of the out flow factors and therefore should also be deleted from the in flow side. Since this internal mobility occurs within Minnesota it does not add to or subtract from the number of new vocationally reimbursed teachers needed in the state. The degree to which the internal mobility is different between vocational program levels within program area (i.e., one might predict more movement from secondary to post-secondary and adult positions rather than vice versa) is ignored in both Table 3 and 4. Teacher education institutions in Minnesota were separated as a source because it represented a more traditional route of entry. All other sources were combined into one group and represented the alternatives to this route.

SUMMARY

The purpose of Phase II of the study was to estimate the size of the out flow factors and the relative size of the in flow factors affecting the supply of teachers in vocationally reimbursed positions in Minnesota. These purposes were achieved by using historical data from the past five years for vocationally reimbursed teachers in vocational programs in a selected sample of schools.[11] Care must be taken in generalizing from this information into the future because many of the programs, particularly at the post-secondary level, were experiencing rapid growth during the past five years. A period of rapid growth may differ from a period of relative stability in terms of size of replacement rate and sources of new teachers.

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[11] Except for agriculture programs where information on the full population was available (see footnote 9).

Table 4

SOURCES OF TEACHERS FOR VOCATIONALLY REIMBURSED POSITIONS IN MINNESOTA (1966-67 TO 1971-72)[a]

PROGRAM AREAS	PROGRAM LEVELS		
	Secondary	Post-Secondary	Adult
Agriculture[b]			
New Graduates from Teacher Ed. Inst. in Minn.	44%	5%	20%
Other Sources	56	95	80
Business and Office			
New Graduates from Teacher Ed. Inst. in Minn.	18[c]	14	-
Other Sources	85	86	-
Distributive			
New Graduates from Teacher Ed. Inst. in Minn.	69	31	-
Other Sources	31	69	-
Health			
New Graduates from Teacher Ed. Inst. in Minn.	0[d]	0[d]	-
Other Sources	100	100	-
Home Economics			
New Graduates from Teacher Ed. Inst. in Minn.	69	-	-
Other Sources	31	-	-
Technical			
New Graduates from Teacher Ed. Inst. in Minn.	-	0	-
Other Sources	-	100	-
Trade and Industry			
New Graduates from Teacher Ed. Inst. in Minn.	21	36	-
Other Sources	79	64	-

[a]Expressed as a percentage of the number of teachers hired in the program area and level. A reasonable range in the estimates (given the average ratio of sample size to population size, given a chance of capturing the true value within the range in 90 out of 100 samples, and assuming a random sample) is the estimate given in the table plus or minus 10. Note that "Other Sources" may also include graduates from teacher education institutions in Minnesota if they did something other than teach in a vocationally reimbursed position (i.e. job in industry, military, non-reimbursed teaching job) immediately after graduation and before then taking a vocationally reimbursed position in Minnesota.

[b]The data base used to derive the rates for vocational agriculture teachers was taken from the study "Job Mobility Patterns for Teachers of Vocational Agriculture in Minnesota" by Ruth Thomas, Dennis Moeller, Julie Robinson, and Edgar Persons, Division of Agriculture Education, University of Minnesota, 1974.

[c]Typically secondary level vocationally reimbursed positions in business and office education require occupational and teaching experience and are therefore not generally available to new graduates.

[d]None of the teacher education institutions in Minnesota had an approved program during this time period.

Also, an examination of the data in Appendix II concerning out flow factors shows no death and retirement for teachers in some program areas and levels over the past five years - it may be that the rate is very small because many of the vocational programs are relatively new and the teachers relatively young but eventually death and retirement may become a significant out flow factor. Both of the above considerations would cause the replacement rate estimates based on past history to be conservative when viewing program areas and levels which may experience less rapid growth in the future.

Also, the estimated size of the out flow factors and the relative size of the in flow factors affecting supply was based on a five year history of the in flow and out flow of teachers in a relatively small sample of programs in each program area and level. Within the selected programs the sampling unit is teacher-years, that is, if the average number of teachers in the selected programs was 25 then the number of teacher-years would be 125. It was assumed the same information would be generated by obtaining in flow and out flow data about a small group of teachers over time (i.e. 25 teachers for 5 years) as for a large group of teachers in one year (i.e. 125 teachers in a selected year). The former alternative was much more manageable to accomplish in terms of data collection. However, the results of implementing this alternative showed that there was wide variation in the in flow and out flow rate of teachers between programs at the same level and area. Because this was the case, the estimate of in flow and out flow size was not as reliable as expected. The indication of possible range in the estimates supplied at the bottom of Tables 3 and 4 was based on the assumption of a representative sample of programs which may not have been achieved because of the small sample and wide variation within schools. However, the range in estimates suggested in Tables 3 and 4 can be used as a best approximation to the true range at this time. The next chapter will combine the data on supply with the data on demand making explicit the estimated future need for new teachers in vocationally reimbursed positions in Minnesota.

CHAPTER IV

NEED FOR TEACHERS IN VOCATIONALLY REIMBURSED POSITIONS

The purpose of this chapter is to combine the information on demand and supply of teachers presented in Chapters II and III in order to provide an estimate of the future need for new teachers in vocationally reimbursed positions in Minnesota. The future time period selected was between the school year 1972-73 and 1978-79, which is a six year period.

PROCEDURE

The estimate of average annual need for new teachers was accomplished by adding: (1) Average annual growth or decline in demand and (2) average number of teachers who need to be replaced (out flow).

Average annual growth or decline in demand was taken as shown in Table 2. For example, the average annual growth in reimbursed secondary vocational agriculture positions was estimated at "2" in Table 2. As calculated in Table 2, growth or decline was assumed to be a constant amount each year.

Average annual number of vocationally reimbursed teachers who need to be replaced (out flow) was calculated by multiplying the average annual replacement rate shown in Table 3 times the average number of teachers employed at each program level within a program area. The average number of teachers employed at each program level and program area for the time period is shown in Table 5. The estimated average number of teachers who need to be replaced annually (out flow) in each program area and level is shown in Table 6. As an illustration, the average annual number of reimbursed secondary vocational agriculture teachers for the time period 1972-73 to 1978-79 is shown as 337 in Table 5. The number 337 was calculated by adding 331 (the estimated number of secondary vocational agriculture positions in 1972-73 as shown in Table 1) and 343 (the estimated number of secondary vocational agriculture positions in 1978-79 also shown in Table 1) and dividing the sum by two to get an average (331 + 343 + 2 = 337). The average number of secondary vocational agriculture teachers who need to be replaced each year during the time period 1972-73 to 1978-79 is shown as 40 in Table 6. The number 40 was calculated by multiplying twelve percent (the average annual replacement rate for secondary vocational agriculture teachers shown in Table 3) times 337 (the average annual number of vocational agriculture teachers during the time period as shown in Table 5) (.12 X 337 = 40). In using this procedure, it was assumed that: (1) The average annual replacement rate which had occured for the past five years would continue to hold in the future, (2) part-time adult and special teachers (except for agriculture teachers of veterans programs for which data was available) had the same replacement rate as secondary teachers, and (3) all positions are filled each year.

Table 5

ESTIMATED AVERAGE ANNUAL TOTAL DEMAND FOR TEACHERS IN VOCATIONALLY REIMBURSED POSITIONS IN MINNESOTA, 1972-73 TO 1978-79

PROGRAM AREAS	PROGRAM LEVELS						TOTAL[a]
	Elementary	Secondary	Post-Secondary	Adult Part-Time	Adult Full-Time	Special	
Agriculture	11	337	51	231	114	52	565
Business and Office	-	509	298	539	-	-	807
Distributive	-	201	152	166	8	-	361
Health	-	166	220	100	-	-	386
Home Economics	13	1294	45	249	14	13	1379
Technical	-	-	257	274	9	-	266
Trade and Industry	-	338	621	823	41	-	1000
TOTAL	24	2845	1644	2382	186	65	4764

[a]Does not include part-time adult instructors.

Table 6

ESTIMATED AVERAGE ANNUAL NUMBER OF TEACHERS IN VOCATIONALLY REIMBURSED POSITIONS WHO NEED TO BE REPLACED IN MINNESOTA, 1972-73 TO 1978-79

PROGRAM AREAS	PROGRAM LEVELS						TOTAL[a]
	Elementary	Secondary	Post-Secondary	Adult Part-Time	Adult Full-Time	Special	
Agriculture	-	40	7	26	5	5	57
Business and Office	-	20	12	22	-	-	32
Distributive	-	8	8	8	-	-	16
Health	-	3	9	1	-	-	12
Home Economics	-	65	1	12	-	-	66
Technical	-	-	10	3	-	-	10
Trade and Industry	-	14	19	49	-	-	33
Total	0	150	66	121	5	5	226

[a]Does not include part-time adult instructors.

RESULTS

The estimate of annual growth or decline (see Table 2) was added to the estimated annual replacement (see Table 6) to derive an estimate of average annual need for new teachers in vocationally reimbursed positions in each program area and level in Minnesota for the time period 1972-73 to 1978-79. The results are shown in Table 7. For example, in the case of secondary vocational agriculture teachers, estimated annual average growth of two teachers (Table 2) was added to estimated average number of teachers to be replaced, 40 (Table 6), to obtain "42" as an estimate of the average annual need for new secondary vocational agriculture teachers. This method of calculating need assumes that all teachers who leave vocational teaching will be replaced.

ASSUMPTIONS AND LIMITATIONS

In order to clearly identify the assumptions and limitations on which the validity and reliability of the estimates presented depend, they are summarized below:

1. Only teachers in vocationally reimbursed positions whose salaries are at least partially reimbursed by vocational education funds in the state under the Vocational Education Act of 1968 are included. Excluded are groups such as non-reimbursed business and office teachers, industrial arts teachers, home economics teachers, and teachers in MDTA programs, apprenticeship programs, private vocational schools, and industry based training.

2. Replacement rates observed in the last five years will remain constant over the next six years. Cautions were raised concerning this assumption because the past five years was a high growth period for some vocational program areas and levels--the replacement rates may not be the same during a period of relative stability--and because death and retirement, although not a significant out flow factor in the past, may become significant as vocational teachers become an older group.

3. Major changes in the funding and organization of vocational education will not be made in the next six years.

4. Demand for teachers in vocationally reimbursed positions will be filled by supply each year. This assumption was made in order to obtain an estimate of total number of teachers in vocationally reimbursed positions in the state which was needed to derive the number of replacement teachers needed.

5. Part time adult and special instructors have the same replacement rate as secondary instructors (except for agriculture teachers of veterans programs where data was available).

Table 7

ESTIMATED AVERAGE ANNUAL NUMBER OF NEW TEACHERS NEEDED IN VOCATIONALLY REIMBURSED POSITIONS IN MINNESOTA, 1972-73 TO 1978-79

PROGRAM AREAS	PROGRAM LEVELS						TOTAL[a]
	Elementary	Secondary	Post-Secondary	Adult Part-Time	Adult Full-Time	Special	
Agriculture	3	42	9	21	11	6	71
Business and Office	-	22	15	30	-	-	37
Distributive	-	23	18	16	1	-	42
Health	-	39	19	9	-	-	58
Home Economics	3	57	3	13	1	1	65
Technical	-	-	17	17	1	-	18
Trade and Industry	-	52	27	57	2	-	81
TOTAL	6	235	108	163	16	7	372

[a]Does not include part-time instructors

6. The sample of schools used to estimate the size of in flow and out flow factors affecting supply of reimbursed teachers was representative of the population of schools. This assumption is tenuous since a small sample of schools were selected with reliance placed on a five year history concerning a particular vocational program and level in the selected schools. As the data revealed, there was wide discrepancy between schools on the in flow and out flow of vocationally reimbursed teachers.

7. Need for new teachers caused by growth and decline in demand and by replacement of existing teachers will be a constant amount per year. This assumption will not hold for special groups such as the vocational agriculture instructors teaching veterans.

8. The panel of experts used to estimate future demand, although small in size, represent the best and most feasible source of demand information at this time. Also, that the average of their individual estimates is a "best" estimate for the particular vocational program and level in question.

9. All teachers who leave vocationally reimbursed positions will be replaced by vocationally reimbursed teachers. This assumption appears to be valid since the number of reimbursed programs and teachers is expected to increase or at least remain constant rather than decrease.

CONCLUSIONS AND IMPLICATIONS

The purpose of the research reported was to provide an estimate of future need for teachers in vocationally reimbursed positions and identify and describe the relative size of sources of supply of teachers in these positions. This information was considered to be of high priority in the vocational education planning and policy making process. The study population includes only teachers in vocationally reimbursed positions in Minnesota, not all teachers in the subject matter areas of vocational education.

Given the assumptions and limitations listed in the previous section, the data presented is a "best" estimate of desired variables (i.e. teacher demand, growth or decline, new teachers needed, size of supply from various sources). Despite the wide range in estimates of demand by the panel of experts and the small sample of schools used to estimate in flow and out flow of teachers, the estimates appear to be valid when reviewed by knowledgeable persons and when compared to enrollment expectations.

The findings of the study show a need for approximately 370 new teachers each year in vocationally reimbursed positions in Minnesota over the next five years. This projected need for new teachers implies a continuing job market for certified

vocational teachers and the necessity for continued responsiveness by various sources of new teachers. Based on the data collected, it is further estimated that growth in number of teachers in vocationally reimbursed positions is likely to begin leveling off after five years. This implies that the need for new teachers will then depend primarily upon replacement requirements. The findings on relative size of sources of new teachers shows that some program areas and levels have a substantial number of entering teachers who are other than new graduates from teacher education institutions in Minnesota. The implication is that there is a need to evaluate alternative sources as to their cost and effectiveness and the long range impact of their use upon the State's teacher education program and total vocational education program.

The estimated average annual total number of full-time teachers in vocationally reimbursed positions in Minnesota over the next five years was shown to be approximately 4750. The implication concerning potential scope of supervision, coordination, and in-service education for these teachers is evident. The scope of this need is compounded by the present variety of alternative sources of new teachers in vocationally reimbursed positions.

Also, the findings of this study allow conclusions and implications about some special groups of teachers. First, the findings show that a number of reimbursed teachers in new program levels will be added in the next five years (i.e. elementary and special) implying the possible need for new preparatory programs for these new kinds of teachers. Second, it appears that each program area has a large number of part-time teachers for adult programs. Most of these teachers are teachers at other program levels or persons whose main occupation is other than vocational teaching. The implication is that there may be a need for coordination and in-service education for this rather sizeable, heterogeneous group as a means of insuring their effectiveness.

In summary, the information on need for new teachers presented in Table 7 provides an estimate of employment opportunities for vocationally certified teachers. Table 4 provides a perspective on how these opportunities have been filled in the past during the years of rapid expansion. Major changes in how opportunities are to be filled in the future merits considerable discussion by those supplying teachers, hiring teachers, and managing the vocational education system in Minnesota. Further research might attempt to assess the quality of teachers from each source as well as the cost of producing the teachers. The information presented in Table 1 describes the potential size of the population which must be supervised, coordinated, and provided in-service education. Hopefully, a continuation of this study will be to assess the particular kinds of assistance and further education desired and needed by those already employed as vocational education teachers in Minnesota.

APPENDIX I

SUMMARY DATA ON FUTURE DEMAND
AND AVERAGE ANNUAL GROWTH OR
DECLINE OF TEACHERS

Table 8

Teachers in Vocationally Reimbursed Positions in Minnesota:
Estimated Future Demand and Average Annual Growth or Decline[a]

Program Area: AGRICULTURE (Ag. and Nat. Res., Environ., Marine Science)

Level of Instruction	Past						Future[c]			Growth or Decline	
	67-68	68-69	69-70	70-71	71-72	72-73	74-75 (1 year)	78-79 (5 year)	83-84[b] (10 year)	72-73 to 78-79	Average Annual
Adult at Secondary or Post Secondary School — Full Time	264	232	256	296	318	R: 83-125 M: 97 N: 3	R: 89-140 M: 106 N: 3	R: 105-165 M: 130 N: 3	R: 115-200 M: 162 N: 3	33	6
Adult at Secondary or Post Secondary School — Part Time						R: 175-320 M: 245 N: 3	R: 165-300 M: 238 N: 3	R: 165-275 M: 217 N: 3	R: 100-260 M: 197 N: 3	-28	-5
Post Secondary Institutes and Junior Colleges	25	20	34	30	31	R: 31-57 M: 44 N: 4	R: 33-65 M: 48 N: 4	R: 35-80 M: 57 N: 4	R: 38-75 M: 62 N: 4	13	2
Junior and Senior High School (Grades 7-12)	307	288	302	296	310	R: 314-366 M: 331 N: 4	R: 275-375 M: 329 N: 5	R: 275-395 M: 343 N: 5	R: 275-410 M: 357 N: 5	12	2
Elementary (Grades K-6)						R: 0-2 M: 1 N: 3	R: 3-15 M: 9 N: 3	R: 10-29 M: 21 N: 3	R: 32-50 M: 41 N: 3	20	3
Special Veterans (specify)					27	R: 48-49 M: 48 N: 3	R: 80-95 M: 88 N: 3	R: 34-70 M: 55 N: 3	R: None M: 0 N: 0	7	1

[a] Estimates of future numbers of teachers were made in June and July of 1973. Estimated average annual growth or decline was calculated by subtracting the number of teachers in 1978-79 from the number in 1972-73 and dividing by 6.

[b] Should be used only to indicate trend rather than as an absolute number.

[c] The estimates are described in terms of R (range), M (mean), and N (number of estimators).

Table 9

Teachers in Vocationally Reimbursed Positions in Minnesota: Estimated Future Demand and Average Annual Growth or Decline[a]

Program Area: Business and Office (Bus. and Office, Fine Arts and Humanities)

Level of Instruction	Past						Future[c]			Growth or Decline	
	67-68	68-69	69-70	70-71	71-72	72-73	74-75 (1 year)	78-79 (5 year)	83-84[b] (10 year)	72-73 to 78-79	Average Annual
Adult at Secondary or Post Secondary School — Full Time	219	248	488	498	509	R: M: N:	R: M: N:	R: M: N:	R: M: N:		
Part Time						R: None M: 515 N: 2	R: 525-530 M: 528 N: 2	R: 550-575 M: 563 N: 2	R: 575-625 M: 600 N: 2	48	8
Post Secondary Institutes and Junior Colleges	125	156	174	273	283	R: None M: 290 N: 1	R: None M: 298 N: 1	R: None M: 305 N: 1	R: None M: 300 N: 1	15	3
Junior and Senior High School (Grades 7-12)	397	417	401	471	485	R: None M: 503 N: 1	R: None M: 517 N: 1	R: None M: 515 N: 1	R: None M: 508 N: 1	12	2
Elementary (Grades K-6)						R: M: N:	R: M: N:	R: M: N:	R: M: N:		
Special _____ (specify)						R: M: N:	R: M: N:	R: M: N:	R: M: N:		

[a] Estimates of future numbers of teachers were made in June and July of 1973. Estimated average annual growth or decline was calculated by subtracting the number of teachers in 1978-79 from the number in 1972-73 and dividing by 6.

[b] Should be used only to indicate trend rather than as an absolute number.

[c] The estimates are described in terms of R (range), M (mean), and N (number of estimators).

Table 10

Teachers in Vocationally Reimbursed Positions in Minnesota: Estimated Future Demand and Average Annual Growth or Decline[a]

Program Area: DISTRIBUTIVE (Marketing and Distributive)

Level of Instruction	Past						Future[c]			Growth or Decline	
	67-68	68-69	69-70	70-71	71-72	72-73	74-75 (1 year)	78-79 (5 year)	83-84[b] (10 year)	72-73 to 78-79	Average Annual
Adult at Secondary or Post Secondary School — Full Time	105	122	116	132	136	R: None M: 5 N: 2	R: 5-10 M: 8 N: 2	R: 6-15 M: 11 N: 2	R: 8-70 M: 14 N: 2	6	1
Adult at Secondary or Post Secondary School — Part Time						R: 140-145 M: 143 N: 2	R: None M: 160 N: 2	R: 175-200 M: 188 N: 2	R: 195-240 M: 218 N: 2	45	8
Post Secondary Institutes and Junior Colleges	27	54	63	86	90	R: 121-126 M: 123 N: 2	R: 150-160 M: 150 N: 2	R: 165-195 M: 180 N: 2	R: 200-280 M: 240 N: 2	57	10
Junior and Senior High School (Grades 7-12)	99	110	124	134	139	R: 150-160 M: 155 N: 2	R: 180-250 M: 203 N: 3	R: 220-300 M: 247 N: 3	R: 250-373 M: 298 N: 3	92	15
Elementary (Grades K-6)						R: M: N:	R: M: N:	R: M: N:	R: M: N:		
Special (specify)						R: M: N:	R: M: N:	R: M: N:	R: M: N:		

[a] Estimates of future numbers of teachers were made in June and July of 1973. Estimated average annual growth or decline was calculated by subtracting the number of teachers in 1978-79 from the number in 1972-73 and dividing by 6.

[b] Should be used only to indicate trend rather than as an absolute number.

[c] The estimates are described in terms of R (range), M (mean), and N (number of estimators).

Table 11

Teachers in Vocationally Reimbursed Positions in Minnesota:
Estimated Future Demand and Average Annual Growth or Decline[a]

Program Area: HEALTH (Health and Public Service)

Level of Instruction	Past						Future[c]			Growth or Decline	
	67-68	68-69	69-70	70-71	71-72	72-73	74-75 (1 year)	78-79 (5 year)	83-84[b] (10 year)	72-73 to 78-79	Average Annual
Adult at Secondary or Post Secondary School — Full Time	17	21	17	33	35	R: M: N:	R: M: N:	R: M: N:	R: M: N:		
Adult at Secondary or Post Secondary School — Part Time						R: None M: 75 N: 1	R: None M: 100 N: 1	R: None M: 125 N: 1	R: None M: 150 N: 1	50	8
Post Secondary Institutes and Junior Colleges	102	131	170	233	241	R: None M: 189 N: 1	R: None M: 220 N: 1	R: None M: 250 N: 1	R: None M: 250 N: 1	61	10
Junior and Senior High School (Grades 7-12)	0	38	8	35	37	R: None M: 57 N: 1	R: None M: 125 N: 2	R: 250-300 M: 275 N: 2	R: 300-375 M: 350 N: 2	218	36
Elementary (Grades K-6)						R: M: N:	R: M: N:	R: M: N:	R: M: N:		
Special _____ (specify)						R: M: N:	R: M: N:	R: M: N:	R: M: N:		

[a] Estimates of future numbers of teachers were made in June and July of 1973. Estimated average annual growth or decline was calculated by subtracting the number of teachers in 1978-79 from the number in 1972-73 and dividing by 6.

[b] Should be used only to indicate trend rather than as an absolute number.

[c] The estimates are described in terms of R (range), M (mean), and N (number of estimators).

Table 12

Teachers in Vocationally Reimbursed Positions in Minnesota: Estimated Future Demand and Average Annual Growth or Decline[a]

Program Area: HOME ECONOMICS (Cons-Home, Pers. Serv., Recr. and Hosp.)

Level of Instruction	Past						Future[c]			Growth or Decline	
	67-68	68-69	69-70	70-71	71-72	72-73	74-75 (1 year)	78-79 (5 year)	83-84[b] (10 year)	72-73 to 78-79	Average Annual
Adult at Secondary or Post Secondary School — Full Time	639	607	299	179	187	R: None M: 10 N: 1	R: None M: 15 N: 1	R: None M: 18 N: 1	R: None M: 25 N: 1	8	1
Adult at Secondary or Post Secondary School — Part Time						R: 200-290 M: 245 N: 2	R: 200-250 M: 225 N: 2	R: 225-280 M: 252 N: 2	R: 250-350 M: 300 N: 2	7	1
Post Secondary Institutes and Junior Colleges	3	9	4	39	40	R: None M: 40 N: 1	R: None M: 45 N: 1	R: None M: 50 N: 1	R: None M: 55 N: 1	10	2
Junior and Senior High School (Grades 7-12)	518	524	1209	1267	1307	R: 1250-1350 M: 1317 N: 3	R: 900-1390 M: 1122 N: 4	R: 1135-1550 M: 1271 N: 4	R: 1000-1700 M: 1369 N: 4	-46	-8
Elementary (Grades K-6)						R: 3-4 M: 4 N: 2	R: 3-5 M: 4 N: 2	R: 5-50 M: 21 N: 3	R: 5-200 M: 72 N: 3	17	3
Special Handicapped-Homebound (specify)						R: None M: 10 N: 1	R: None M: 12 N: 1	R: None M: 15 N: 1	R: None M: 15 N: 1	5	1

[a] Estimates of future numbers of teachers were made in June and July of 1973. Estimated average annual growth or decline was calculated by subtracting the number of teachers in 1978-79 from the number in 1972-73 and dividing by 6.

[b] Should be used only to indicate trend rather than as an absolute number.

[c] The estimates are described in terms of R (range), M (mean), and N (number of estimators).

Table 13

Teachers in Vocationally Reimbursed Positions in Minnesota: Estimated Future Demand and Average Annual Growth or Decline[a]

Program Area: TECHNICAL

Level of Instruction	Past						Future[c]			Growth or Decline	
	67-68	68-69	69-70	70-71	71-72	72-73	74-75 (1 year)	78-79 (5 year)	83-84[b] (10 year)	72-73 to 78-79	Average Annual
Adult at Secondary or Post Secondary School — Full Time	196	172	179	191	196	R: 1-10 M: 5 N: 2	R: 1-15 M: 7 N: 2	R: 5-20 M: 12 N: 2	R: 10-20 M: 15 N: 2	7	1
Adult at Secondary or Post Secondary School — Part Time						R: 200-289 M: 233 N: 3	R: 220-350 M: 273 N: 3	R: 275-370 M: 315 N: 3	R: 300-463 M: 371 N: 3	82	14
Post Secondary Institutes and Junior Colleges	130	148	206	210	218	R: 225-250 M: 237 N: 2	R: 232-275 M: 253 N: 2	R: 275-280 M: 277 N: 2	R: 260-347 M: 303 N: 2	40	7
Junior and Senior High School (Grades 7-12)	0	1	13	3	5	R: M: N:	R: M: N:	R: M: N:	R: M: N:		
Elementary (Grades K-6)						R: M: N:	R: M: N:	R: M: N:	R: M: N:		
Special _____ (specify)						R: M: N:	R: M: N:	R: M: N:	R: M: N:		

[a] Estimates of future numbers of teachers were made in June and July of 1973. Estimated average annual growth or decline was calculated by subtracting the number of teachers in 1978-79 from the number in 1972-73 and dividing by 6.

[b] Should be used only to indicate trend rather than as an absolute number.

[c] The estimates are described in terms of R (range), M (mean), and N (number of estimators).

Table 14

Teachers in Vocationally Reimbursed Positions in Minnesota:
Estimated Future Demand and Average Annual Growth or Decline[a]

Program Area: TRADE AND INDUSTRIAL (Transp., Mfg., Const., Comm. and Media)

Level of Instruction	Past						Future[c]			Growth or Decline	
	67-68	68-69	69-70	70-71	71-72	72-73	74-75 (1 year)	78-79 (5 year)	83-84[b] (10 year)	72-73 to 78-79	Average Annual
Adult at Secondary or Post Secondary School — Full Time	321	536	759	778	794	R: 10-60 M: 35 N: 2	R: 10-60 M: 35 N: 2	R: 15-80 M: 47 N: 2	R: 25-85 M: 55 N: 2	12	2
Part Time						R: 740-850 M: 800 N: 3	R: 730-900 M: 832 N: 3	R: 800-925 M: 845 N: 3	R: 800-1050 M: 950 N: 3	45	8
Post Secondary Institutes and Junior Colleges	186	283	371	412	428	R: M: 596 N:	R: 550-596 M: 573 N: 2	R: 575-715 M: 645 N: 2	R: 575-787 M: 681 N: 2	49	8
Junior and Senior High School (Grades 7-12)	70	91	120	175	181	R: 200-250 M: 225 N: 2	R: 225-400 M: 317 N: 3	R: 300-600 M: 450 N: 3	R: 375-575 M: 458 N: 3	225	38
Elementary (Grades K-6)						R: M: N:	R: M: N:	R: M: N:	R: M: N:		
Special (specify)						R: M: N:	R: M: N:	R: M: N:	R: M: N:		

[a] Estimates of future numbers of teachers were made in June and July of 1973. Estimated average annual growth or decline was calculated by subtracting the number of teachers in 1978-79 from the number in 1972-73 and dividing by 6.

[b] Should be used only to indicate trend rather than as an absolute number.

[c] The estimates are described in terms of R (range), M (mean), and N (number of estimators).

APPENDIX II

SUMMARY DATA ON FACTORS AFFECTING
THE SUPPLY OF TEACHERS

Table 16

TEACHERS IN VOCATIONALLY REIMBURSED POSITIONS IN MINNESOTA: SIZE OF OUTFLOW FACTORS AFFECTING SUPPLY (1966067 TO 1971-72)

Program Level and Area	Man-Year[a] Base	Causes of Replacement Need[b]							As Source of Demand[c]
		Geographic Mobility Out of State	Geographic Mobility in Minnesota						
			Total	Advancement	Died or Retired	Occupational Mobility	Temporary Withdrawal	Vocational Teaching	
Agriculture[d]									
Secondary	-	1	20	2	1	7	1	9	12
Post-Secondary	-	0	17	2	1	10	0	4	13
Adult	-	0	11	1	1	4	0	5	6
Special	-	0	19	3	0	7	0	9	10
Business & Office									
Secondary	210	3	2	0	0	0	1	1	4
Post-Secondary	195	0	7	3	0	1	0	3	4
Adult	-	-	-	-	-	-	-	-	-
Distributive									
Secondary	131	0	5	1	0	2	1	1	4
Post-Secondary	145	0	12	3	1	1	0	7	5
Adult	-	-	-	-	-	-	-	-	-
Health									
Secondary	45	0	4	0	0	2	0	2	2
Post-Secondary	205	0	4	0	0	4	0	0	4
Adult	-	-	-	-	-	-	-	-	-
Home Economics									
Secondary	205	1	5	1	0	2	1	1	5
Post-Secondary[e]	-	1	3	0	0	2	0	1	3
Adult	-	-	-	-	-	-	-	-	-
Technical									
Secondary	-	-	-	-	-	-	-	-	-
Post-Secondary	100	0	6	0	2	2	0	2	4
Adult	-	-	-	-	-	-	-	-	-
Trade & Industry									
Secondary	176	1	7	1	0	2	0	4	4
Post-Secondary	190	1	3	0	0	2	0	1	3
Adult	-	-	-	-	-	-	-	-	-

[a] The estimates which are presented in the next columns are based on a summary for a given average staff size in the selected schools in a time period of five years. Man-years is calculated by multiplying the average staff size by five.

[b] Expressed as annual percent of total number of teachers employed in the program area and level.

[c] Sum or the rate caused by all sources excluding vocational teaching [for example, the percent of out flow for teachers of secondary agriculture programs is 1% (geographic mobility out of state) + 20% (total geographic mobility in Minnesota) - 9% (vocational teaching mobility in Minnesota) which is equal to 12%].

[d] The source of reported data for agriculture teachers is based on the study, "Job Mobility Patterns for Teachers of Vocational Agriculture in Minnesota", authored by Ruth Thomas, Dennis Moeller, Julie Robinson, and Edgar Persons which covers the full population of agriculture teachers from 1969-70 to 1973-74 school years.

[e] The rates estimated for post-secondary home economics teachers were assumed to be the same as for post-secondary trade and industry teachers since in the post-secondary vocational technical institutes the programs are often grouped with the trade and industry programs.

Table 17

TEACHERS IN VOCATIONALLY REIMBURSED POSITIONS IN MINNESOTA: SIZE OF INFLOW FACTORS AFFECTING SUPPLY (1966-67 TO 1971-72)

Program Level and Area	Man-Year[a] Base	Sources of Teacher Supply[b]							As Source of Supply[c]
		Geographic Mobility Into State	Geographic Mobility in Minnesota						
			Total	Teacher Training	Vocational Teaching	Non-Vocational Teaching	Re-entrants	Unemployed	
Agriculture[d]									
Secondary[e]	-	7	20	8	9	2	1	0	18
Post-Secondary	-	3	23	1	4	14	4	0	22
Adult	-	1	9	1	5	2	1	0	5
Special	-	26	50	12	9	18	11	0	67
Business & Office									
Secondary	210	3	10	2	2	5	1	0	11
Post-Secondary	195	2	9	2	1	3	2	1	10
Adult	-	-	-	-	-	-	-	-	-
Distributive									
Secondary	131	1	13	9	1	2	1	0	13
Post-Secondary	145	5	11	4	3	3	1	0	13
Adult	-	-	-	-	-	-	-	-	-
Health									
Secondary	45	1	6	0	1	5	0	0	6
Post-Secondary	205	1	10	0	2	8	0	0	9
Adult	-	-	-	-	-	-	-	-	-
Home Economics									
Secondary	205	1	14	9	2	2	0	1	13
Post-Secondary[e]	-	3	12	5	1	6	0	0	14
Adult	-	-	-	-	-	-	-	-	-
Technical									
Secondary	-	-	-	-	-	-	-	-	-
Post-Secondary	100	3	13	0	1	12	0	0	15
Adult	-	-	-	-	-	-	-	-	-
Trade & Industry									
Secondary	176	5	13	3	4	2	3	1	14
Post-Secondary	190	3	12	5	1	6	0	0	14
Adult	-	-	-	-	-	-	-	-	-

[a] The estimates which are presented in the next columns are based on a summary for a given average staff size in the selected schools in a time period of five years. Man-years is calculated by multiplying the average staff size by five.

[b] Expressed as annual percent of total number of teachers employed in the program area and level.

[c] Sum of the rate caused by all sources excluding vocational teaching [for example, the percent of in flow of teachers of secondary agriculture programs is 7% (geographic mobility into state) + 20% (geographic mobility in Minnesota) - 9% (vocational teaching) which is equal to 18%].

[d] See "d" in Table 16; the rate for special teachers is for those teaching veterans and is very high since the program started during the covered time period.

[e] See "e" in Table 16.

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